

MENDMENTS TO THE CLAIMS:

Please replace the claims with the claims provided in the listing below wherein status, amendments, additions and cancellations are indicated.

1.(Original) A method for processing a metal body which turns the metal structure of the metal body into the finer grain structure by forming a low deformation resistance region where the deformation resistance is locally lowered in the metal body and by deforming the low deformation resistance region by shearing, wherein

using a non-low deformation resistance region forming means which forms a non-low deformation resistance region by increasing the deformation resistance which is lowered in the low deformation resistance region, the non-low deformation resistance region is formed along the low deformation resistance region.

2.(Original) A method for processing a metal body which turns the metal structure of the metal body into the finer grain structure by forming a low deformation resistance region which traverses the metal body by locally lowering the deformation resistance of a metal body which extends in one direction and by deforming the low deformation resistance region by shearing, wherein

using a non-low deformation resistance region forming means which forms a non-low deformation resistance region by increasing the deformation resistance which is lowered in the low deformation resistance region, the non-low deformation resistance region is formed along at least one side periphery of the low deformation resistance region.

3.(Original) A method for processing a metal body according to claim 2, wherein the metal body is moved along the extending direction and, at the same time, the non-low deformation resistance region is formed by the non-low deformation resistance region forming means along side peripheries of the low deformation resistance region at a downstream side in the moving direction.

4.(Previously presented) A method for processing a metal body according to claim 1, wherein the non-low deformation resistance region forming means includes cooling means which cools the metal body.

5.(Currently amended) A method for processing a metal body ~~which turns the metal structure of the metal body into the finer grain structure by forming a low deformation resistance region where the deformation resistance is locally~~

~~lowered in the metal body and by deforming the low deformation resistance region~~
~~by shearing~~ according to claim 1, wherein

the low deformation resistance region is formed in a vacuum.

6.(Currently amended) A method for processing a metal body ~~which~~
~~turns the metal structure of the metal body into the finer grain structure by forming~~
~~a low deformation resistance region where the deformation resistance is locally~~
~~lowered in the metal body and by deforming the low deformation resistance region~~
~~by shearing~~ according to claim 1, wherein

the low deformation resistance region is formed in a high pressure
atmosphere.

7.(Currently amended) A method for processing a metal body ~~which~~
~~turns the metal structure of the metal body into the finer grain structure by forming~~
~~a low deformation resistance region where the deformation resistance is locally~~
~~lowered in the metal body and by deforming the low deformation resistance region~~
~~by shearing~~ according to claim 1, wherein

the low deformation resistance region is formed in an active gas
atmosphere.

8.(Original) A method for processing a metal body according to claim 7, wherein the active gas is nitrogen gas.

9.(Original) A method for processing a metal body according to claim 7, wherein the active gas is methane gas and/or carbon monoxide gas.

10.(Currently amended) A method for processing a metal body ~~which turns the metal structure of the metal body into the finer grain structure by forming a low deformation resistance region where the deformation resistance is locally lowered in the metal body and by deforming the low deformation resistance region by shearing~~ according to claim 1, wherein

a powdery material is sprayed to the low deformation resistance region.

11.(Currently amended) A method for processing a metal body ~~which turns the metal structure of the metal body into the finer grain structure by forming a low deformation resistance region where the deformation resistance is locally lowered in the metal body and by deforming the low deformation resistance region by shearing~~ according to claim 1, wherein

ion doping is applied to the low deformation resistance region.

12.(Currently amended) A method for processing a metal body ~~which turns the metal structure of the metal body into the finer grain structure by forming a low deformation resistance region where the deformation resistance is locally lowered in the metal body and by deforming the low deformation resistance region by shearing~~ according to claim 1, wherein

the low deformation resistance region is formed by applying second heating to the metal body after applying first heating for a given time.

13.(Cancelled)

14.(Currently amended) A method for processing a metal body ~~which turns the metal structure of the metal body into the finer grain structure by forming a low deformation resistance region where the deformation resistance is locally lowered in the metal body and by deforming the low deformation resistance region by shearing~~ according to claim 1, wherein

the low deformation resistance region is formed in a non-constraining region of constraining means which constrains the metal body heated to a high temperature.

15.(Cancelled)

16.(Currently Amended) A method for processing a metal body according to claim [[5]] 1, wherein the metal body is quenched after the deformation by shearing.

17.(Currently amended) A method for processing a metal body ~~which turns the metal structure of the metal body into the finer grain structure by forming a low deformation resistance region where the deformation resistance is locally lowered in the metal body and by deforming the low deformation resistance region by shearing~~ according to claim 1, wherein

the low deformation resistance region is formed by heating the metal body and, at the same time, the metal body is quenched after the low deformation resistance region is deformed by shearing.

18.(Cancelled)

19.(Currently amended) A method for processing a metal body ~~which turns the metal structure of the metal body into the finer grain structure by forming a low deformation resistance region where the deformation resistance is locally lowered in the metal body and by deforming the low deformation resistance region by shearing~~ according to claim 1,

the low deformation resistance region is formed in the metal body which is immersed in a liquid.

20.(Original) A method for processing a metal body according to claim 19, wherein the low deformation resistance region is formed by heating the metal body in the liquid.

21.(Original) A method for processing a metal body according to claim 20, wherein in forming the low deformation resistance region, the heat conductivity of a periphery of the low deformation resistance region is lowered.

22.(Original) A method for processing a metal body according to claim 20, wherein in forming the low deformation resistance region, bubbles are generated in a periphery of the low deformation resistance region.

23.(Cancelled)

24.(Previously presented) A method for processing a metal body according to claim 1, wherein the metal body which has the finer metal structure

is subjected to plastic forming without turning the metal structure into coarser grain structure.

25.(Currently amended) A method for processing a metal body according to claim [[23]] 24, wherein the plastic forming is performed in a heated state for a short time which does not turn the metal structure of the metal body into coarser grain structure.

26.(Currently Amended) A method for processing a metal body according to claim [[23]] 24, wherein the aging treatment is performed ~~without turning~~ by maintaining the metal body at a temperature which does not turn the metal structure into coarser grain structure after the metal structure is subjected to the plastic forming.

27.(Previously presented) A method for processing a metal body according to claim 1, wherein the metal body is subjected to the carburizing treatment.

28.(Previously presented) A method for processing a metal body according to claim 1, wherein the metal structure of the metal body is turned into

the finer grain structure by stretching the low deformation resistance region.

29.(Previously presented) A method for processing a metal body according to claim 1, wherein the metal structure of the metal body is turned into the finer grain structure by compressing the low deformation resistance region.

30.(Currently Amended) A method for processing a metal body according to claim [[6]] 1, wherein the metal body is formed in a cylindrical body having a hollow portion and the hollow portion is held in a reduced pressure state.

31.(Previously presented) A method for processing a metal body according to claim 1, wherein the metal body is formed in a cylindrical body having a hollow portion and the hollow portion is held in a high pressure state.

32.(Previously presented) A method for processing a metal body according to claim 1, wherein a forming guide body which forms the metal body into a given shape is brought into contact with the low deformation resistance region.

33.(Original) A method for processing a metal body according to claim 32, wherein the forming guide body constitutes heating means which heats the metal body.

34.(Original) A method for processing a metal body according to claim 32, wherein the forming guide body constitutes cooling means which cools the metal body.

35.(Previously presented) A method for processing a metal body according to claim 1, wherein the low deformation resistance region is formed in a transverse manner in the metal body which is extended in one direction, and the low deformation resistance region is moved along the extending direction of the metal body.

36.(Previously presented) A method for processing a metal body according to claim 1, wherein the low deformation resistance region traverses the metal body, and one of non-low deformation resistance regions of the metal body which sandwich the low deformation resistance region has a position thereof fluctuated relative to another non-low deformation resistance region is fluctuated thus deforming the low deformation resistance region by shearing.

37.(Original) A method for processing a metal body according to claim 36, wherein the fluctuation of the position is a vibratory motion having vibratory motion components which allow the vibratory motion of one non-low deformation resistance region relative to another non-low deformation resistance region in the direction substantially orthogonal to the extending direction of the metal body.

38.(Original) A method for processing a metal body according to claim 36, wherein the fluctuation of the position is a one-way rotational motion which allows the rotation of one non-low deformation resistance region relative to another non-low deformation resistance region about a rotary axis which is arranged substantially parallel to the extending direction of the metal body.

39.(Original) A method for processing a metal body according to claim 36, wherein the fluctuation of the position is a both-way rotational motion which allows the rotation of one non-low deformation resistance region relative to another non-low deformation resistance region about a rotary axis which is arranged substantially parallel to the extending direction of the metal body.

40.(Currently amended) A method for processing a metal body ~~being characterized in that~~ according to claim 1, wherein a metal body in a heated state which is extended in one direction is moved along the extending direction, the metal body is cooled by allowing the metal body to pass through cooling means~~[[,]]~~ which constitutes the non-low deformation resistance region forming means thus forming the non-low deformation resistance region and, at the same time, the cooled metal body is subjected to a vibratory motion thus turning the metal structure in the metal body into the finer grain structure by deforming the metal structure by shearing before the metal body is allowed to pass through the cooling means.

41.(Currently amended) A method for processing a metal body ~~being characterized in that~~ according to claim 1, wherein in performing solution heat treatment by quenching a metal body which is heated up to a temperature for performing the solution heat treatment using cooling means which constitutes the non-low deformation resistance region forming means, the metal body at a quenched portion is deformed by shearing thus turning the metal structure into finer metal structure and the solution heat treatment is performed.

42.(Original) A method for processing a metal body according to claim

41, wherein the deformation of the metal body by shearing is performed by imparting a vibratory motion which includes vibratory motion components which generate the vibratory motion in the direction substantially orthogonal to the extending direction of the metal body which is extended in one direction to the metal body.

43.(Original) A method for processing a metal body according to claim 41, wherein the deformation of the metal body by shearing is performed by imparting a one-way rotational motion which generates the rotation about a rotational axis substantially parallel to the extending direction of the metal body which is extended in one direction to the metal body.

44.(Original) A method for processing a metal body according to claim 41, wherein the deformation of the metal body by shearing is performed by imparting a both-way rotational motion which generates the rotation about a rotational axis substantially parallel to the extending direction of the metal body which is extended in one direction to the metal body.

45.(Previously presented) A method for processing a metal body according to claim 41, wherein the metal body whose metal structure is turned into

the finer grain structure is formed into a given shape by performing plastic forming under a condition which prevents the metal structure from becoming coarse.

46.(Currently amended) A method for processing a metal body ~~which~~ according to claim 1, wherein the method turns the metal structure of the metal body into the finer grain structure in which a first low deformation resistance region and a second low deformation resistance region which traverse the metal body are formed in a spaced-apart manner by a given distance by locally lowering the deformation resistance of the metal body which extends in one direction, a non-low deformation resistance region which increases the deformation resistance larger than the deformation resistance of the first low deformation resistance region and the second low deformation resistance region is formed between the first low deformation resistance region and the second low deformation resistance region using non-low deformation resistance region forming means, and a vibratory motion including vibratory motion components in the direction orthogonal to the extending direction of the metal body is imparted to the non-low deformation resistance region thus deforming the first low deformation resistance region and the second low deformation resistance region by shearing.

47.(Currently amended) A method for processing a metal body ~~which~~

according to claim 1, wherein the method turns the metal structure of the metal body into the finer grain structure in which a first low deformation resistance region and a second low deformation resistance region which traverse the metal body are formed in a spaced-apart manner by a given distance by locally lowering the deformation resistance of the metal body which extends in one direction, a non-low deformation resistance region which increases the deformation resistance larger than the deformation resistance of the first low deformation resistance region and the second low deformation resistance region is formed between the first low deformation resistance region and the second low deformation resistance region using non-low deformation resistance region forming means, and a one-way rotational motion about a rotary axis substantially parallel to the extending direction of the metal body is imparted to the non-low deformation resistance region thus deforming the first low deformation resistance region and the second low deformation resistance region by shearing whereby the metal structure of the metal body is turned into the finer grain structure.

48.(Cancelled)

49.(Previously presented) A method for processing a metal body according to claim 46, wherein the metal body is moved along the extending direction.

50. - 85. (Cancelled)